

WHAT IS CLAIMED IS:

1           1.       A method, comprising:  
2           sending a link layer login from a first port to a second port;  
3           subsequently, sending an application layer login from the first port to the second  
4 port to establish a first data path, wherein the first data path is from the first port to the  
5 second port; and  
6           subsequently, sending another application layer login from the second port to the  
7 first port to establish a second data path, wherein the second data path is from the second  
8 port to the first port.

1           2.       The method of claim 1, further comprising:  
2           determining that the second port has an initiated link layer login to the first port,  
3 prior to sending the another application layer login from the second port to the first port;  
4 and  
5           restricting the second port from sending another link layer login to the first port,  
6 wherein sending the another link layer login would cause a termination of the established  
7 first data path from the first port to the second port.

1           3.       The method of claim 1, further comprising:  
2           restricting the second port to sending the another application layer login to the  
3 first port in response to determining that the second port has an initiated link layer login  
4 to the first port, wherein restricting the second port causes a retention of the established  
5 first data path from the first port to the second port, and wherein restricting the second  
6 port and sending the another application layer login causes bidirectional data transfer to  
7 take place between the first and second ports.

1           4.       The method of claim 1, wherein a bidirectional data transfer application  
2 prevents the second port from sending another link layer login to the first port, wherein  
3 sending the another link layer login would cause a termination of the first data path.

1           5.       The method of claim 1, wherein the method is performed by one or more  
2       bidirectional data transfer applications that are implemented in first and second fibre  
3       channel adapters coupled to the first and second ports respectively, wherein the first and  
4       second fibre channel adapters are coupled to first and second storage controllers  
5       respectively, and wherein the first and second ports are coupled via one fibre channel  
6       link associated with the first and second data paths.

1           6.       A method, comprising:  
2           establishing a first data path from a first port to a second port;  
3           determining, at the first port, whether the second port has a second data path  
4       established from the second port to the first port;  
5           sending an application layer logout, from the first port to the second port, in  
6       response to determining that the second port has the second data path established from the  
7       second port to the first port; and  
8           terminating the first data path from the first port to the second port in response to  
9       receiving the application layer logout at the second port.

1           7.       The method of claim 6, wherein terminating the first data path from the  
2       first port to the second port does not terminate the second data path from the second port  
3       to the first port.

1           8.       The method of claim 6, wherein a bidirectional data transfer application  
2       prevents the first port from sending a link layer logout to the first port, wherein sending  
3       the link layer logout would cause a termination of the first and second data paths.

1           9.       The method of claim 6, wherein the method is performed by one or more  
2       bidirectional data transfer applications that are implemented in first and second fibre  
3       channel adapters coupled to the first and second ports respectively, wherein the first and  
4       second fibre channel adapters are coupled to first and second storage controllers

5 respectively, and wherein the first and second ports are coupled via one fibre channel  
6 link associated with the first and second data paths.

1           10.    The method of claim 6, wherein the application level logout is sent via an  
2 application level logout frame, and wherein the first and second ports are capable of  
3 sending and receiving a link level login frame, a link level logout frame, an application  
4 level login frame and the application level logout frame over a fibre channel connection  
5 coupling the first and second ports.

1           11.    A system, comprising:  
2           a first port;  
3           a second port coupled to the first port;  
4           means for sending a link layer login from the first port to the second port;  
5           means for sending an application layer login from the first port to the second port  
6 to establish a first data path, wherein the first data path is from the first port to the second  
7 port; and  
8           means for sending another application layer login from the second port to the first  
9 port to establish a second data path, wherein the second data path is from the second port  
10 to the first port.

1           12.    The system of claim 11, further comprising:  
2           means for determining that the second port has an initiated link layer login to the  
3 first port, prior to sending the another application layer login from the second port to the  
4 first port; and  
5           means for restricting the second port from sending another link layer login to the  
6 first port, wherein sending the another link layer login would cause a termination of the  
7 established first data path from the first port to the second port.

1           13.    The system of claim 11, further comprising:

2 means for restricting the second port to sending the another application layer login  
3 to the first port in response to determining that the second port has an initiated link layer  
4 login to the first port, wherein restricting the second port causes a retention of the  
5 established first data path from the first port to the second port, and wherein restricting  
6 the second port and sending the another application layer login causes bidirectional data  
7 transfer to take place between the first and second ports.

1 14. The system of claim 11, wherein a bidirectional data transfer application  
2 prevents the second port from sending another link layer login to the first port, wherein  
3 sending the another link layer login would cause a termination of the first data path.

1 15. The system of claim 11, further comprising:  
2 a first fibre channel adapter coupled to the first port;  
3 a second fibre channel adapter coupled to the second port;  
4 a first storage unit coupled to the first fibre channel adapter;  
5 a second storage unit coupled to the second fibre channel adapter;  
6 one fibre channel link coupling the first port and second port, wherein the one  
7 fibre channel link is associated with the first and second data paths; and  
8 one or more bidirectional data transfer applications that are implemented in the  
9 first and second fibre channel adapters, wherein the one or more bidirectional data  
10 transfer applications may perform sending the link layer login, the application layer login,  
11 and the another application layer login.

1 16. A system, comprising:  
2 a first port;  
3 a second port coupled to the first port;  
4 means for establishing a first data path from the first port to the second port;  
5 means for determining, at the first port, whether the second port has a second data  
6 path established from the second port to the first port;

7 means for sending an application layer logout, from the first port to the second  
8 port, in response to determining that the second port has the second data path established  
9 from the second port to the first port; and  
10 means for terminating the first data path from the first port to the second port in  
11 response to receiving the application layer logout at the second port.

1 17. The system of claim 16, wherein terminating the first data path from the  
2 first port to the second port does not terminate the second data path from the second port  
3 to the first port.

1 18. The system of claim 16, wherein a bidirectional data transfer application  
2 prevents the first port from sending a link layer logout to the first port, wherein sending  
3 the link layer logout would cause a termination of the first and second data paths.

1 19. The system of claim 16, further comprising:  
2 a first fibre channel adapter coupled to the first port;  
3 a second fibre channel adapter coupled to the second port;  
4 a first storage unit coupled to the first fibre channel adapter;  
5 a second storage unit coupled to the second fibre channel adapter;  
6 one fibre channel link coupling the first port and second port, wherein the one  
7 fibre channel link associated with the first and second data paths; and  
8 one or more bidirectional data transfer applications that are implemented in the  
9 first and second fibre channel adapters, wherein the one or more bidirectional data  
10 transfer applications may perform establishing the first data path, determining whether the  
11 second port has a second data path established, sending an application layer logout, and  
12 terminating the first data path.

1 20. The system of claim 16, wherein the application level logout is sent via an  
2 application level logout frame, and wherein the first and second ports are capable of  
3 sending and receiving a link level login frame, a link level logout frame, an application

4 level login frame and the application level logout frame over a fibre channel connection  
5 coupling the first and second ports.

1 21. An article of manufacture, wherein the article of manufacture is capable of  
2 causing operations, the operations comprising:

3 sending a link layer login from a first port to a second port;

4 subsequently, sending an application layer login from the first port to the second  
5 port to establish a first data path, wherein the first data path is from the first port to the  
6 second port; and

7 subsequently, sending another application layer login from the second port to the  
8 first port to establish a second data path, wherein the second data path is from the second  
9 port to the first port.

1 22. The article of manufacture of claim 21, the operations further comprising:

2 determining that the second port has an initiated link layer login to the first port,  
3 prior to sending the another application layer login from the second port to the first port;

4 restricting the second port from sending another link layer login to the first port,  
5 wherein sending the another link layer login would cause a termination of the established  
6 first data path from the first port to the second port.

1 23. The article of manufacture of claim 21, the operations further comprising:

2 restricting the second port to sending the another application layer login to the  
3 first port in response to determining that the second port has an initiated link layer login  
4 to the first port, wherein restricting the second port causes a retention of the established  
5 first data path from the first port to the second port, and wherein restricting the second  
6 port and sending the another application layer login causes bidirectional data transfer to  
7 take place between the first and second ports.

1 24. The article of manufacture of claim 21, wherein a bidirectional data  
2 transfer application prevents the second port from sending another link layer login to the

3 first port, wherein sending the another link layer login would cause a termination of the  
4 first data path.

1 25. The article of manufacture of claim 21, wherein the operations are  
2 performed by one or more bidirectional data transfer applications that are implemented in  
3 first and second fibre channel adapters coupled to the first and second ports respectively,  
4 wherein the first and second fibre channel adapters are coupled to first and second storage  
5 controllers respectively, and wherein the first and second ports are coupled via one fibre  
6 channel link associated with the first and second data paths.

1 26. An article of manufacture, wherein the article of manufacture is capable of  
2 causing operations, the operations comprising:  
3 establishing a first data path from a first port to a second port;  
4 determining, at the first port, whether the second port has a second data path  
5 established from the second port to the first port;  
6 sending an application layer logout, from the first port to the second port, in  
7 response to determining that the second port has the second data path established from the  
8 second port to the first port; and  
9 terminating the first data path from the first port to the second port in response to  
10 receiving the application layer logout at the second port.

1 27. The article of manufacture of claim 26, wherein terminating the first data  
2 path from the first port to the second port does not terminate the second data path from  
3 the second port to the first port.

1 28. The article of manufacture of claim 26, wherein a bidirectional data  
2 transfer application prevents the first port from sending a link layer logout to the first  
3 port, wherein sending the link layer logout would cause a termination of the first and  
4 second data paths.

1           29.     The article of manufacture of claim 26, wherein the operations are  
2 performed by one or more bidirectional data transfer applications that are implemented in  
3 first and second fibre channel adapters coupled to the first and second ports respectively,  
4 wherein the first and second fibre channel adapters are coupled to first and second storage  
5 controllers respectively, and wherein the first and second ports are coupled via one fibre  
6 channel link associated with the first and second data paths.

1           30.     The article of manufacture of claim 26, wherein the application level  
2 logout is sent via an application level logout frame, and wherein the first and second ports  
3 are capable of sending and receiving a link level login frame, a link level logout frame, an  
4 application level login frame and the application level logout frame over a fibre channel  
5 connection coupling the first and second ports.